3.12 Geology and Soils

This section describes the environmental setting for geology, seismicity, and soils and the impacts on geology, seismicity, and soils that would occur as a result of the proposed action. Much of the information herein is derived from the Kings Beach Commercial Core Improvement Project Administrative Draft EIR/EIS authored by Mactec (2006b).

3.12.1 Affected Environment

3.12.1.1 Geology and Topography

This section addresses the regional and action area geology and topography.

Regional Geology and Topography

The action area is located in the Sierra Nevada geomorphic province. The Sierra Nevada is a strongly asymmetric mountain range with a long gentle western slope and a high and steep eastern escarpment. It averages 50 to 80 miles wide and runs through eastern California for more than 400 miles—from the Mojave Desert on the south to the Cascade Range and the Modoc Plateau on the north (Bateman and Wahrhaftig 1966).

The Sierra Nevada is a huge block of the earth's crust that has broken free along the Sierra Nevada fault system and been tilted westward. It is overlapped on the west by sedimentary rocks of the Great Valley geomorphic province and on the north by volcanic sheets extending south from the Cascade Range. A blanket of volcanic material caps large areas in the northern part of the range (Bateman and Wahrhaftig 1966).

Most of the southern half of the Sierra Nevada and the eastern part of the northern half are composed of plutonic (chiefly granitic) rocks of Mesozoic age. These rocks constitute the Sierra Nevada batholith. In the northern half of the range, the batholith is flanked on the west by the western metamorphic belt, a terrane of strongly deformed, but weakly metamorphosed sedimentary and volcanic rocks of Paleozoic and Mesozoic age.

The batholith extends eastward to the eastern edge of the range (Bateman and Wahrhaftig 1966).

Geology and Topography of the Action Area

Kings Beach is located on the north shore of Lake Tahoe, which is situated in an intermountain basin between the Sierra Nevada and the Carson Range. Lake Tahoe formed in a graben, or down dropped block, bound on the east and west by a series of discontinuous, generally east and west dipping normal faults (dePolo et al. 1997; Gardner et al. 2000). The northern end of the Basin is commonly accepted to have been closed by a combination of faulting and repeated episodes of volcanic activity and glacial advances during the late Pliocene and early Pleistocene, blocking the basin outlet and allowing Lake Tahoe to form (Saucedo 2005).

The southern Basin is primarily underlain by Mesozoic granitic rocks that are part of the Sierra Nevada batholith. The northern Basin is primarily underlain by Cenozoic volcanic rocks. Quaternary glacial deposits are widespread on the southern and western edges of the Basin, while much of the northern edge is covered by Miocene and early Pleistocene volcanic and intrusive rocks (Saucedo 2005).

Miocene andesite and dacite flow outcrops are present on the shoreline immediately west of the action area. Surrounding Kings Beach are other areas of Miocene andesite and dacite flow outcrops; andesite and basaltic andesite flows; and undivided andesitic and dacitic lahars, flows, breccia, and volcaniclastic sediments (Saucedo 2005).

The action area is primarily on beach and lake deposits of Holocene age. The Holocene beach deposits are composed of moderately sorted, fine- to very coarse-grained to gravelly arkosic sand derived from the decomposition of granite. The Holocene lake deposits are composed of thin-bedded sandy silt and clay (Saucedo 2005).

3.12.1.2 Seismicity

Seismic hazards are earthquake fault ground rupture and ground shaking (primary hazards) and liquefaction and earthquake-induced slope failure (secondary hazards). Ground shaking is the most significant seismic hazards in the action area.

The Basin is located in a seismically active region of the United States. Earthquakes have occurred in the vicinity of the action area in the past and can be expected to occur again in the near future. Scientists have discovered that the Basin has many active faults and are currently mapping them. These scientists have uncovered evidence that Basin faults have had prehistoric earthquakes of a magnitude of 7 within the past 10,000 years. However, from extensive study of other Great Basin fault zones, scientists believe that large quakes are "rare events" in the Basin, meaning quakes of magnitude 6.5 or greater occur on individual faults about every 3,000 to 4,000 years (Segale and Cobourn 2005).

Farther east, the Reno–Carson City urban corridor is located in a very seismically active region. Earthquakes occurring in the Reno–Carson City urban corridor have the potential to trigger secondary hazards in the action area, if the earthquakes are strong enough in magnitude and close enough to the action area. The probability of at least one magnitude $\geq$ 6 event in the Reno–Carson City urban corridor is estimated to be between 34% and 98%, the probability of a magnitude $\geq$ 6.6 event between 9% and 64%, and the probability of a magnitude $\geq$ 7 event between 4% and 50% (dePolo et al. 1997).

In brief, the action area could be affected by earthquakes that are nearby but outside of its boundaries, further raising the total estimated hazard. Overall, the probabilities of potentially damaging earthquakes within the region (including the action area) are relatively high and are commensurate with many parts of California. Thus, the earthquake hazard and potential in the Reno–Carson City urban corridor and the action area should be considered high (dePolo et al. 1997).

Surface Rupture and Faulting

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) is to regulate development near-active faults to mitigate the hazard of surface rupture. Faults in an Alquist-Priolo Earthquake Fault Zone are typically active faults. As defined under the Alquist-Priolo Act, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). An early Quaternary fault (formerly known as a potentially active fault) is one that has had surface displacement during Quaternary time (last 1.6 million years). A pre-Quaternary fault is one that has had surface displacement before the Quaternary period.

There is only one recognized active fault within a 20-mile radius of the action area—the North Tahoe–Incline Village fault zone (Jennings 1994; Saucedo 2005)—but this fault zone is not in an Alquist-Priolo Earthquake Fault Zone (Hart and Bryant 1997). Several early Quaternary faults are located within a 20-mile radius of the action area, including the West Tahoe-Dollar Point fault zone. These faults or fault zones are not located in Alquist-Priolo Earthquake Fault Zones (Hart and Bryant 1997). Several pre-Quaternary faults are also present in an approximately 20-mile radius of the action area, including the Agate Bay fault and its associated fault complex. None of these faults or fault zones is in Alquist-Priolo Earthquake Fault Zones (Hart and Bryant 1997). Of all the faults described above, the North Tahoe fault is closest to the action area, located within a few miles of it.

Furthermore, buried thrust faults and inferred faults are located near the action area. These faults are not officially recognized as of yet by Caltrans, the State, or the Uniform Building Code (UBC), but they are potential sources of seismic activity (dePolo et al. 1997). More Quaternary faults are suspected to exist, some within ranges and others buried by recent alluvium within basins. Furthermore, the estimated slip rates generally only consider faults with normal slip, although suspicious lineaments and a predominance of strike-slip focal mechanisms from local earthquakes indicate unrecognized strike-slip faulting (Martinelli 1989). Thus, it is suggested that future research will tend to increase

these rates and, consequently, increase the geologic probability estimates of having an earthquake in the region. Accordingly, the seismic hazards for the action area are affected by both the recognized faults and these buried thrust faults and inferred faults. The buried thrust faults and inferred thrust faults are not listed in Alquist-Priolo Earthquake Fault Zones because they do not have surface ruptures and are not officially recognized.

Based on existing published data on officially recognized faults, the risk of surface rupture and faulting in the action area is apparently low because none of the active faults described above directly occur in the vicinity of the action area. However, this scenario is likely to change in the near future as other faults are discovered and mapped accordingly.

Ground-Shaking Hazard

The action area is located in UBC Seismic Hazard Zone 3. The Zone 3 designation indicates earthquakes in the region have the potential to make standing difficult and to cause stucco and some masonry walls to fall. Structures must be designed to meet the regulations and standards associated with Zone 3 hazards. As described above, the action area is located in a region of California characterized by historical seismic activity. However, the UBC recognizes no active seismic source in the action area vicinity (International Conference of Building Officials 1997).

As described above, the risk of surface rupture in the action area is generally low because of its distance from active faults. However, earthquake-induced ground shaking poses a slightly more significant hazard. The measurement of the energy released at the point of origin, or epicenter, of an earthquake is referred to as the magnitude, which is generally expressed in the Richter Magnitude Scale or as moment magnitude. The scale used in the Richter Magnitude Scale is logarithmic so that each successively higher Richter magnitude reflects an increase in the energy of an earthquake of about 31.5 times. Moment magnitude is the estimation of an earthquake magnitude by using seismic

moment, which is a measure of an earthquake size utilizing rock rigidity, amount of slip, and area of rupture.

The greater the energy released from the fault rupture, the higher the magnitude of the earthquake. Earthquake energy is most intense at the fault epicenter; the farther an area from an earthquake epicenter, the less likely that ground shaking will occur there. Geologic and soil units comprising unconsolidated, clay-free sands and silts can reach unstable conditions during ground shaking, which can result in extensive damage to structures built on them (see *Liquefaction and Related Hazards* below).

Ground shaking is described by two methods: ground acceleration as a fraction of the acceleration of gravity (g) or the Modified Mercalli scale, which is a more descriptive method involving 12 levels of intensity denoted by Roman numerals. Modified Mercalli intensities range from I (shaking that is not felt) to XII (total damage).

The intensity of ground shaking that would occur in the action area as a result of an earthquake is partly related to the size of the earthquake, its distance from the action area, and the response of the geologic materials within the action area. As a rule, the earthquake magnitude and the closer the fault rupture to the site, the greater the intensity of ground shaking. When various earthquake scenarios are considered, ground-shaking intensities will reflect both the effects of strong ground accelerations and the consequences of ground failure.

Estimates of Earthquake Shaking

The action area is located in a region of California characterized by a moderate ground-shaking hazard. Based on a probabilistic seismic hazard map that depicts the peak horizontal ground acceleration values exceeded at a 10% probability in 50 years (California Geological Survey 2006; Cao et al. 2003), the probabilistic peak horizontal ground acceleration values in the action area range from 0.3 to 0.4g, where 1 g equals the force of gravity, thus indicating that the ground-shaking hazard in the action area is moderate. However, probabilistic peak horizontal ground acceleration values are

typically described for firm rocks. As such, ground-shaking hazard is more likely to be higher in the action area because much of the soils are softer alluvium. Farther to the east, the ground-shaking hazard increases even more, coinciding with the increase in abundance of associated faults and fault complexes (California Geological Survey 2006; Cao et al. 2003).

Liquefaction and Related Hazards

Liquefaction is a phenomenon in which the strength and stiffness of unconsolidated sediments are reduced by earthquake shaking or other rapid loading. Poorly consolidated, water-saturated fine sands and silts having low plasticity and located within 50 feet of the ground surface are typically considered to be the most susceptible to liquefaction. Soils and sediments that are not water saturated and that consist of coarser or finer materials are generally less susceptible to liquefaction (California Division of Mines and Geology 1997). Based on the sedimentological characteristics of the soils and the nonsaturated nature of the soils, liquefaction hazard is expected to be low for the action area.

Two potential ground failure types associated with liquefaction are lateral spreading and differential settlement (Association of Bay Area Governments 2001). Lateral spreading involves a layer of ground at the surface being carried on an underlying layer of liquefied material over a gently sloping surface toward a river channel or other open face. Lateral spreading is not common in the region and does not pose a significant hazard. Differential settlement (also called ground settlement, and in extreme cases, ground collapse) occurs as soil compacts and consolidates after the ground shaking ceases. Differential settlement occurs when the layers that liquefy are not of uniform thickness, a common problem when the liquefaction occurs in artificial fills. Settlement can range from 1 to 5%, depending on the cohesiveness of the sediments (Tokimatsu and Seed 1984). In the action area, differential settlement is not expected to be a significant hazard.

Landslides

Within the limits of ground disturbance of the action area, there is no risk of naturally occurring large landslides because it is essentially flat and topographically featureless.

Volcanic Activity

Volcanic activity is not a local concern. The nearest active volcanoes lie in Mono County, in the Mammoth Lakes/Long Valley area, to the northeast of Tulare County, and Lassen Peak in Lassen County.

3.12.1.3 Soils

The soils in the action area have been mapped by the U.S. Department of Agriculture, Soil Conservation Service (now called the Natural Resources Conservation Service) and USFS are described in the soil survey of Tahoe Basin Area, California and Nevada (Rogers 1974)[1]. Kings Beach is within the Inville-Jabu soil association, which consists of nearly level to moderately steep, well-drained and moderately well-drained coarse sandy loams that are deep to very deep over a hardpan. Inville-Jabu soils typically occur on moraines, glacial outwash terraces, and fans.

According to the soil survey, soils in the action area predominantly comprise stony, sandy loams, beach sand, and gravelly alluvium. These soils generally have a slow runoff rate and a slight hazard of erosion. The dominant soil map unit in the action area is Jabu stony sandy loam, moderately fine subsoil variant of the Jabu series. This well-drained soil formed in andesitic alluvium overlying older lake sediments. It has a slow runoff rate and erosion hazard is slight. The easternmost edge of the action area (and a small portion of land in the center of the action area) is mapped as the Umpa very stony sandy loam soil. This soil is well-drained, overlays andesite, and is associated with steeper mountainous uplands. It has a medium runoff rate and erosion hazard is slight. The western shoreline portion of the action area is mapped as a beach. It is composed of

[1] This soil survey for this area is currently being updated; however, new mapping efforts will most likely not provide any new substantial differences in known soil conditions.

coarse sand derived mainly from granitic alluvium. Lastly, Griff Creek, on the extreme western side of the action area, is mapped as recent gravelly alluvial land. Gravelly alluvial land consists of small areas of recent gravelly alluvium adjacent to stream channels and in meadows. The runoff rate is very slow and the erosion hazard is slight.

None of the soil map units within the action area are listed as hydric soils (a *hydric soil* is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part) on the National Resources Conservation Service's List of Hydric Soils (Natural Resources Conservation Service 1995).

Soil map units within the action area do not exhibit any shrink-swell characteristics (i.e., they are not expansive).

It is important to recognize that the soil properties described above characterize the soils in their natural, unaltered condition. Development along the shoreline of Kings Beach has altered soil characteristics.

3.12.1.4 Land Capability

Land capabilities districts (LCDs) have been determined for all areas within the Basin. *Land capability* is "the level of use an area can tolerate without sustaining permanent (environmental) damage through erosion or other causes" (Bailey 1974). LCD classes range from 1 to 7, with lower LCD values indicating that the land has a low capability for development (Figure 3.12-1). Use of an area of land is defined as *land coverage* by TRPA and occurs with impervious surfaces, manufactured structures, improvements or other features that prevent vegetation growth and precipitation from infiltrating into the ground surface. A land capability verification of the CCIP was performed by TRPA in 2004 and determined that two land capability classifications exist within the CCIP area: 1b and 5. Classification 1 lands (which include 1a, 1b, and 1c) are not suited for development, grazing, or forestry use. Classification 1b lands are naturally wet, poorly drained, and critical for management and protection of water quality. The allowable impervious cover is 1% for Classification 1b lands. Classification 5 lands are moderately

well suited for urbanization, forestry, and intensive recreation. They are generally flat to moderately sloping, with little or no surface erosion problem. The allowable impervious cover is 25% for Classification 5 lands. Classification 1b within the action area includes both beaches and SEZs. Most of the action area is mapped as Classification 5. However, this could change as a result of the pending verification of the backshore analysis with TRPA. Figure 3.12-1 summarizes LCDs within the Basin, and Figure 3.12-2 indicates LCDs within the KBCC.

3.12.1.5 Shoreland and Shorezone Areas

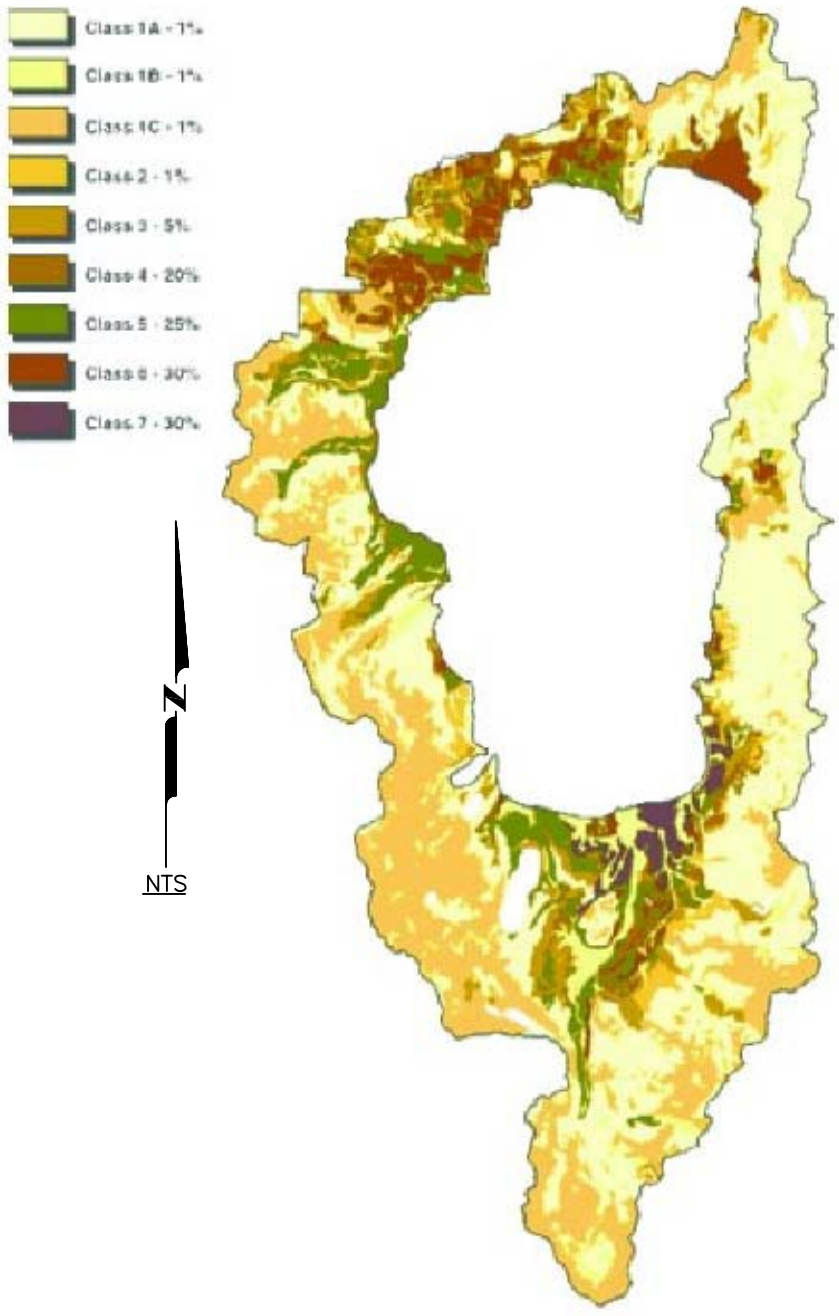
TRPA defines *shoreland* as the lesser of the distance from Lake Tahoe's high-water line to the littoral parcel's most landward boundary, or 300 feet landward. Where the littoral parcel is a narrow parcel not qualifying for a development right (e.g., roadway ROW or dedicated beach access parcel), the adjoining parcel's most landward boundary to the littoral parcel or 300 feet applies. Where the littoral parcel is split by a ROW but is considered one project area, the lesser of the most landward boundary of the project area or 300 feet applies.

TRPA defines *shorezone* as the area including the nearshore, foreshore, and backshore.

The *nearshore* consists of the zone extending from Lake Tahoe's low water elevation (6,223.0 feet Lake Tahoe Datum) to a lake bottom elevation of 6,193 feet Lake Tahoe Datum. The nearshore includes a minimum lateral distance of 350 feet measured from the shoreline (6,229.1 feet Lake Tahoe Datum). For other lakes within the Tahoe Region, the nearshore extends to a depth of 25 feet below the low water elevation.

The *foreshore* is the zone between the high and low water level, which is the zone of lake level fluctuation. This corresponds to elevations of 6,229.1 feet Lake Tahoe Datum and 6,223.0 feet Lake Tahoe Datum, respectively.

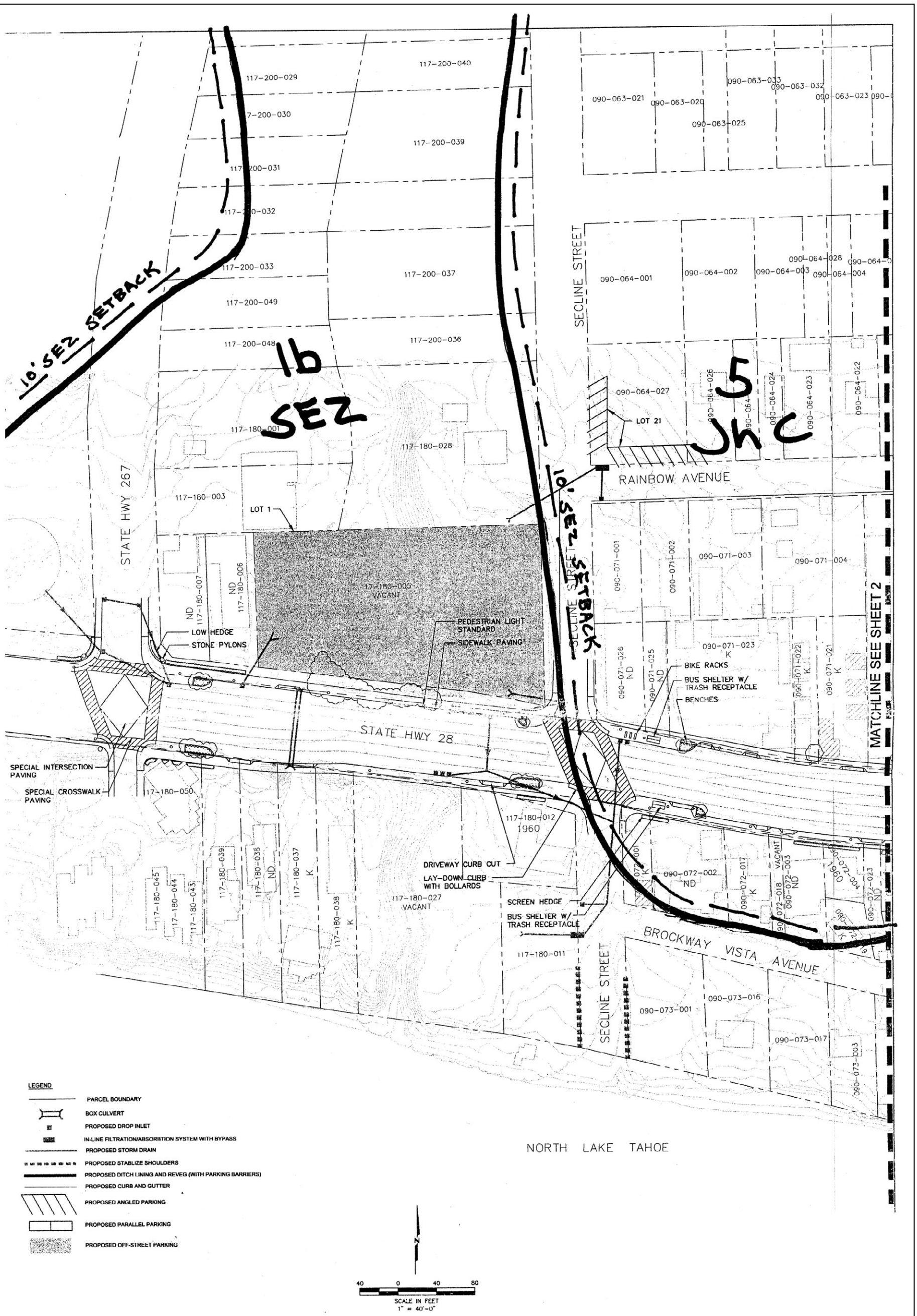
The *backshore* is the zone that extends from the high-water level (elevation 6,229.1 feet) to stable uplands. The allowable base land coverage in the backshore is 1%. Due to the interaction with lake waves and the inherent dynamic nature of littoral processes, this is



Source: Reprinted from the TRPA website
www.trpa.org/land_cap.html,
accessed, February 2006

06676.06 (03-07)

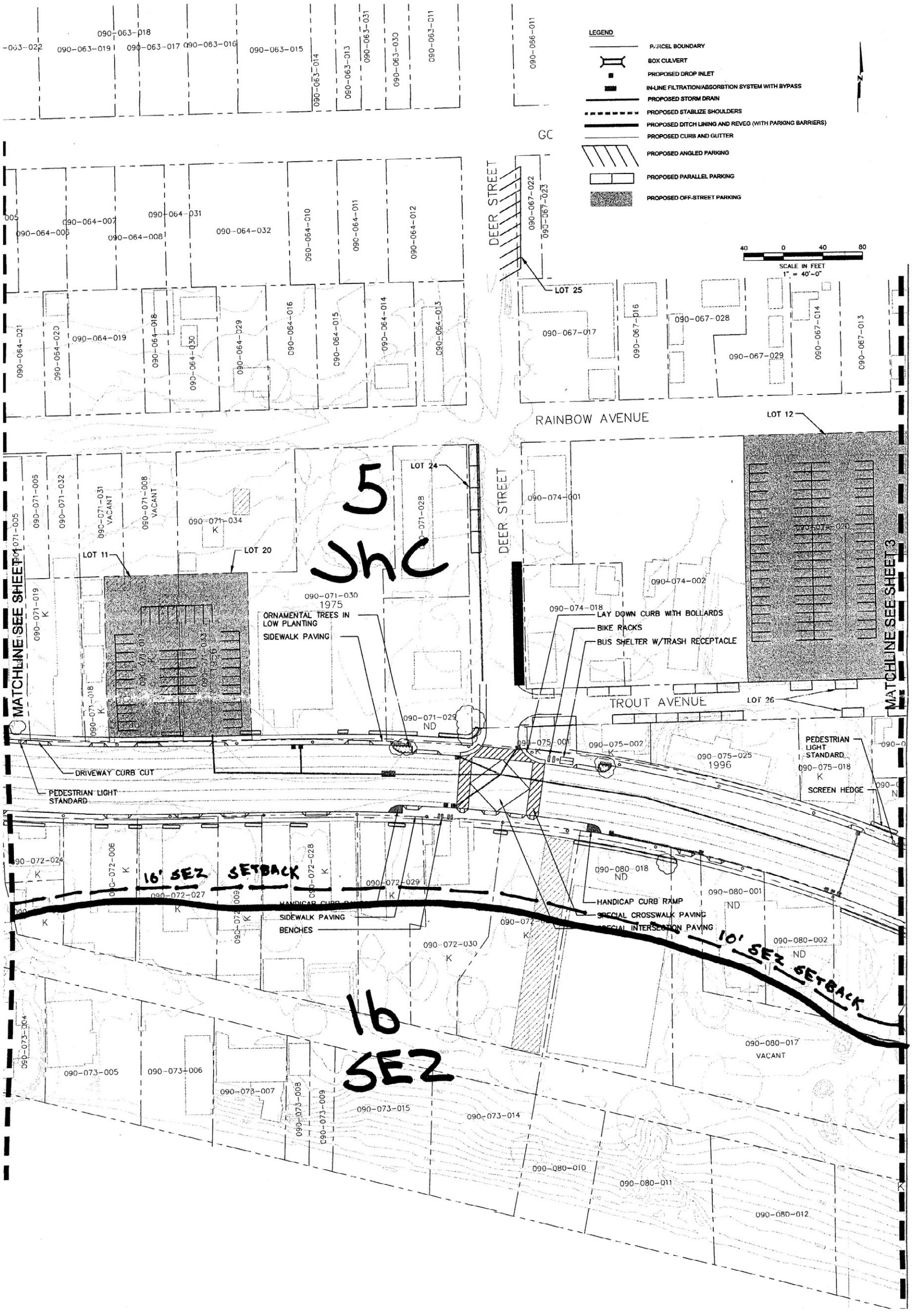
Figure 3.12-1
Kings Beach Commercial Core Improvement Project
Land Capabilities in the Tahoe Basin



06676.06 (02/07)

Source: Placer County

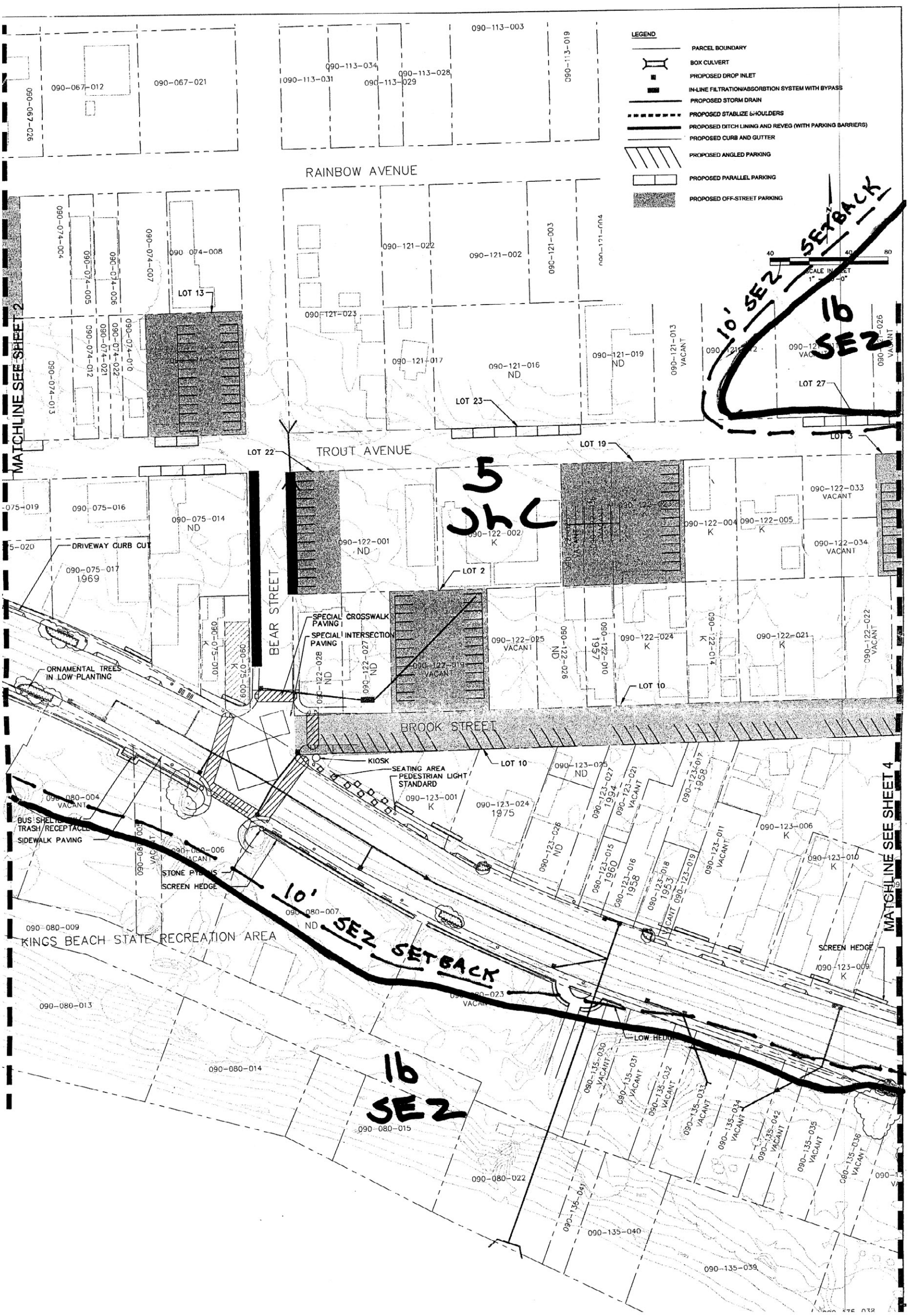
Figure 3.12-2
Land Capabilites in the Kings Beach Commercial Core
Sheet 1 of 5



Source: Placer County

06676.06 (02/07)

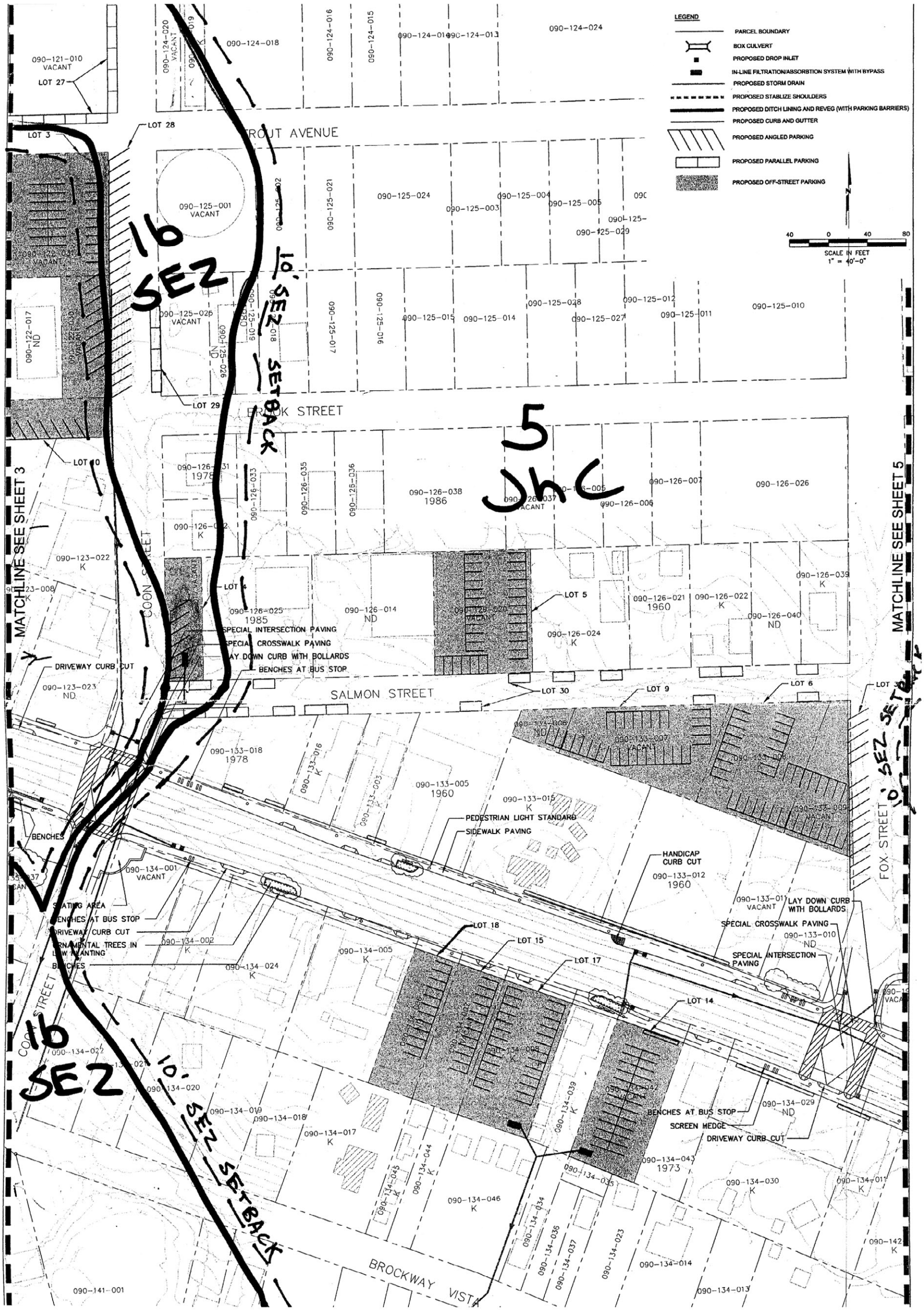
Figure 3.12-2
Land Capabilites in the Kings Beach Commercial Core
Sheet 2 of 5



06676.06 (02/07)

Source: Placer County

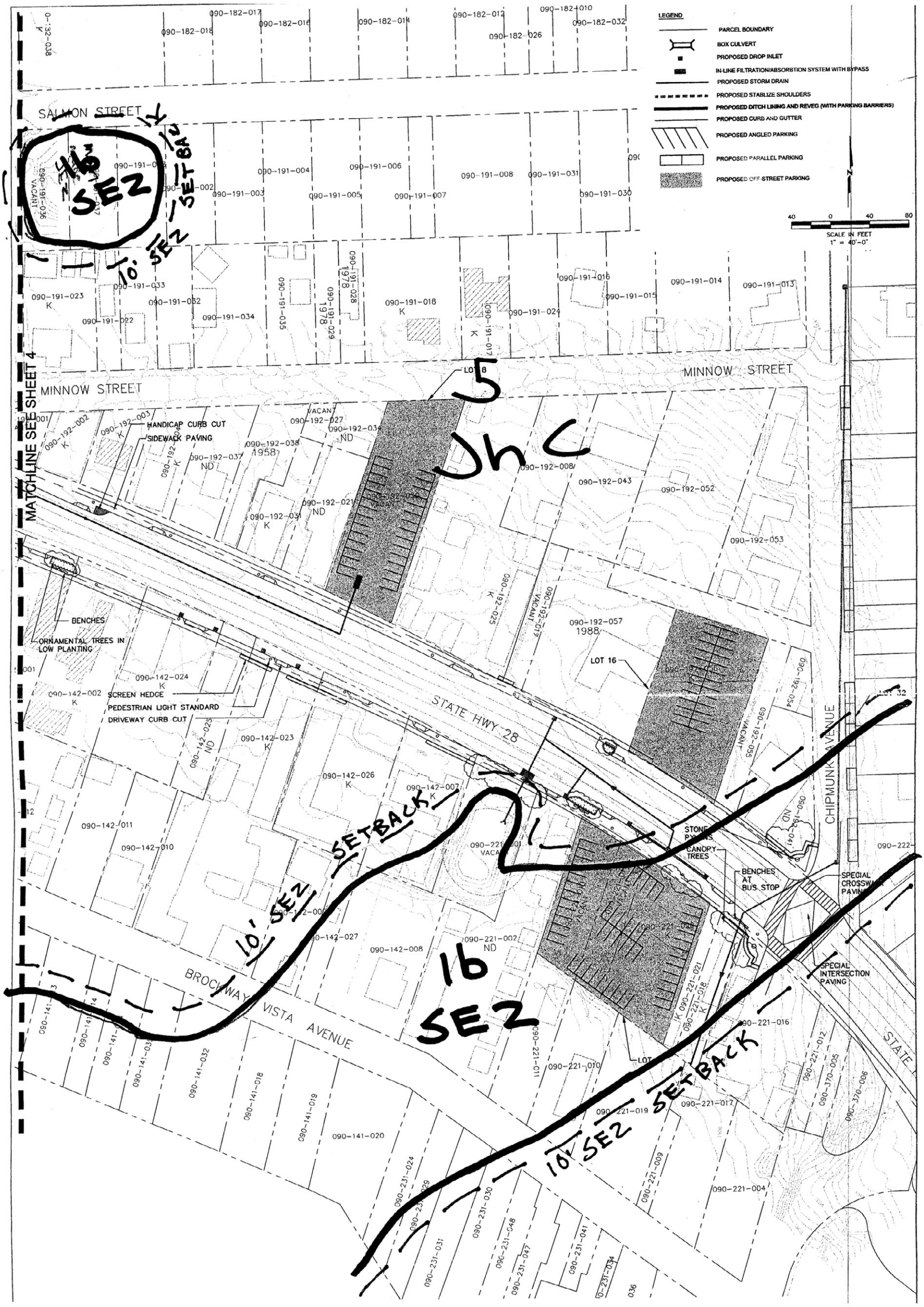
Figure 3.12-2
Land Capabilites in the Kings Beach Commercial Core
Sheet 3 of 5



Source: Placer County

06676.06 (02/07)

Figure 3.12-2
Land Capabilites in the Kings Beach Commercial Core
Sheet 4 of 5



Source: Placer County

06676.06 (02/07)

Figure 3.12-2
Land Capabilites in the Kings Beach Commercial Core
Sheet 5 of 5

considered the area of instability. The backshore boundary is defined two ways: 1) The area of instability plus a 10-foot buffer measured landward from the mapped area of instability is considered the backshore boundary, and 2) the area of wave run-up, plus ten feet.

3.12.2 Regulatory Setting/Tahoe Regional Planning Agency TRPA Thresholds

3.12.2.1 Federal

Clean Water Act, Section 402/National Pollutant Discharge Elimination System

The CWA is discussed in detail in *Section 3.13, Water Quality*. However, because CWA Section 402 is directly relevant to grading and earthwork, additional information is provided below.

Amendments in 1987 to the CWA added Section 402p, which establishes a framework for regulating municipal and industrial stormwater discharges under the NPDES program. The EPA has delegated to the State Water Board the authority for the NPDES program in California, which is implemented by the state's nine regional water quality control boards. Under the NPDES Phase II Rule, construction activity disturbing 1 acre or more must obtain coverage under the state's General Construction Permit. General Construction Permit applicants are required to prepare a Notice of Intent (NOI) and a stormwater pollution prevention program (SWPPP) and implement and maintain BMPs to avoid adverse effects on receiving water quality as a result of construction activities, including earthwork.

Caltrans construction activity is covered by the NPDES permit (Order No. 99-06-DWQ). In addition, construction activity is subject to Tahoe Basin NPDES general construction permit (Board Order 6-00-03). A notification of construction is required for enrollment for projects that have 0.4 hectare (1 acre) of soil disturbance. By law, all storm water discharges associated with construction activity where clearing, grading, and excavation

results in soil disturbance of at least 1 acre of total land area must comply with the provisions of this NPDES Permit and develop and implement an effective SWPPP. Implementation of the plan starts with the commencement of construction and continues through the completion of the project. Upon completion of the project, the applicant must submit a Notice of Termination to the RWQCB to indicate that construction is completed.

The Memorandum of Understanding (MOU) between TRPA and the LRWQCB is discussed in detail in *Section 3.13, Water Quality*.

3.12.2.2 State

Alquist-Priolo Earthquake Fault Zoning Act

California's Alquist-Priolo Act (*PRC Sec. 2621* et seq.), originally enacted in 1972 as the Alquist-Priolo Special Studies Zones Act and renamed in 1994, is intended to reduce the risk to life and property from surface fault rupture during earthquakes. The Alquist-Priolo Act prohibits the location of most types of structures intended for human occupancy across the traces of active faults and strictly regulates construction in the corridors along active faults (Earthquake Fault Zones). It also defines criteria for identifying active faults, giving legal weight to terms such as active and establishes a process for reviewing building proposals in and adjacent to Earthquake Fault Zones.

Under the Alquist-Priolo Act, faults are zoned and construction along or across them is strictly regulated if they are "sufficiently active" and "well-defined." A fault is considered sufficiently active if one or more of its segments or strands shows evidence of surface displacement during Holocene time (defined for purposes of the act as within the last 11,000 years). A fault is considered well defined if its trace can be clearly identified by a trained geologist at the ground surface or in the shallow subsurface, using standard professional techniques, criteria, and judgment (Hart and Bryant 1997). There are no faults identified or mapped in the action area as defined by the act.

Seismic Hazards Mapping Act

Like the Alquist-Priolo Act, the Seismic Hazards Mapping Act of 1990 (*PRC Sec. 2690–2699.6*) is intended to reduce damage resulting from earthquakes. While the Alquist-Priolo Act addresses surface fault rupture, the Seismic Hazards Mapping Act addresses other earthquake-related hazards, including strong ground shaking, liquefaction, and seismically induced landslides. Its provisions are similar in concept to those of the Alquist-Priolo Act: the State is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and cities and counties are required to regulate development within mapped Seismic Hazard Zones (SHZs).

Under the Seismic Hazards Mapping Act, permit review is the primary mechanism for local regulation of development. Specifically, cities and counties are prohibited from issuing development permits for sites in Seismic Hazard Zones until appropriate site-specific geologic or geotechnical investigations have been carried out and measures to reduce potential damage have been incorporated into the development plans. There are no SHZs identified or mapped in the action area.

3.12.2.3 Local

Geotechnical Investigations

Local jurisdictions typically regulate construction activities through a multistage permitting process that may require preparation of a site-specific geotechnical investigation. The purpose of a site-specific geotechnical investigation is to provide a geologic basis for the development of appropriate construction design. Geotechnical investigations typically assess bedrock and Quaternary geology, geologic structure, soils, and previous history of excavation and fill placement.

As part of their general plan, Placer County (Placer County 1994) requires the preparation of a soils engineering and geologic-seismic analysis prior to permitting development in areas prone to geological or seismic hazards (i.e., ground shaking,

landslides, liquefaction, critically expansive soils, avalanches, etc.). See *Placer County General Plan* below for additional information. Additionally, Article 15.48 of Chapter 15 of the Placer County Code (Placer County 2006a) states a soil or geologic investigation report should be performed in areas of known or suspected geological hazards, including landslide hazards and hazards of ground failure stemming from seismically induced ground shaking (*Ord. 5407-B § 13, 2006: Ord. 5056-B [part], 2000*).

Two geotechnical reports have been prepared for this proposed action (Kleinfelder 2004, 2006). The purpose of these reports was to evaluate the feasibility of the proposed construction with respect to the observed subsurface conditions and to provide geotechnical recommendations for the project design. These reports include documentation of soils that may be subject to fault rupture hazard, ground-shaking hazard, or any other limitations. All relevant recommendations from these reports have been included in the *Mitigation, Avoidance, Minimization, and Compensation Measures* section of this section.

Local Grading and Erosion Control Ordinances and Construction Specifications

Many counties and cities have grading and erosion control ordinances. These ordinances are intended to control erosion and sedimentation caused by construction activities. A grading permit is typically required for construction-related projects. As part of the permit, the project applicant usually must submit a grading and erosion control plan, vicinity and site maps, and other supplemental information. Standard conditions in the grading permit include a description of BMPs similar to those contained in a SWPPP.

Placer County Code

Article 15.48 of Chapter 15 of the Placer County Code (Placer County 2006a) describes permitting and issues related to grading, erosion, and sediment control. It also describes Basin area special restrictions and exemptions. Article 12.32 of Chapter 12 of the Placer County Code (Placer County 2006a) describes shoreline protection regulations, including 12.32.060 standards for regulating all construction and alterations on the shoreline,

underlying land, or within a lake (12.32.060). As a lead agency on this project, Placer County will comply with grading, erosion, and sediment control through development of a project-specific SWPPP subject to approval by LRWQCB.

Placer County General Construction Specifications

Placer County General Construction Specifications (Placer County 1994) contain information on grading, subbases and bases, surfacings and pavements, structures, drainage facilities, ROW and traffic control facilities, and materials. Because the majority of improvements are within the Caltrans ROW, construction specifications to be developed for the project will comply with applicable Caltrans standards. For consistency, proposed improvements in the Placer County ROW will also comply with Caltrans standards.

Placer County General Plan

Goals, policies, and implementation programs of the Health and Safety section of the Placer County General Plan (Placer County 1994) that are aimed at reducing the seismic risk to people and property and applicable to the proposed action are described below. Any substantial conflict between the proposed action and these goals, policies, and implementation programs would constitute an adverse effect.

> *Seismic and Geological Hazards*
>
> ***Goal 8.A: To minimize the loss of life, injury, and property damage due to seismic and geological hazards.***
>
> ***Policies***
>
> *8.A.1. The County shall require the preparation of a soils engineering and geologic-seismic analysis prior to permitting development in areas prone to geological or seismic hazards (i.e., ground shaking, landslides, liquefaction, critically expansive soils, avalanche).*
>
> *8.A.9. The County shall require that the location and/or design of any new buildings, facilities, or other development in areas subject to earthquake activity minimize exposure to danger from fault rupture or creep.*

8.A.10. The County shall require that new structures permitted in areas of high liquefaction potential be sited, designed, and constructed to minimize the dangers from damage due to earthquake-induced liquefaction.

TRPA Regional Plan for the Lake Tahoe Basin

Goals and policies of the Regional Plan for the Basin (Tahoe Regional Planning Agency 2004b) that are applicable to the proposed action are as follows.

Land Use Element

Natural Hazards

Goal #1: Risks from natural hazards (e.g., flood, fire, avalanche, earthquake) will be minimized.

Policies

2. *Prohibit construction, grading, and filling of lands within the 100-year flood plain and in the area of wave run-up except as necessary to implement the goals and policies of the plan. Require all public utilities, transportation facilities, and other necessary public uses located in the 100-year flood plain and area of wave run-up to be constructed or maintained to prevent damage from flooding and to not cause flooding.*

Water Quality

Goal #1: Reduce loads of sediment and algal nutrients to Lake Tahoe; meet sediment and nutrient objectives for tributary streams, surface runoff, and sub-surface runoff, and restore 80 percent of the disturbed lands.

Policies

3. *Application of BMPs to projects shall be required as a condition of approval for all projects.*

5. *Units of local government, state transportation departments, and other implementing agencies shall restore 25 percent of the sez lands that have been disturbed, developed, or subdivided in accordance with the capital improvements program (part ii).*

Goal #2: Reduce or eliminate the addition of other pollutants which affect, or potentially affect, water quality in the Tahoe Basin.

Policies

7. The BMPs will be amended to include special construction techniques, discharge standards, and development criteria applicable to projects in the shorezone.

Conservation Element

Soils

Goal #1: Minimize soil erosion and the loss of soil productivity.

Policies

1. Allowable impervious land coverage shall be consistent with the threshold for impervious land coverage.

2. No new land coverage or other permanent disturbance shall be permitted in land capability districts 1–3 except for those uses as noted in a, b, and c below:

A. Single family dwellings may be permitted in land capability districts 1–3 when reviewed and approved pursuant to the individual parcel evaluation system (IPES). (See Goal #1, Policy 2, Development and Implementation Subelement).

B. Public outdoor recreation facilities may be permitted in land capability districts 1–3 if:

(1) The project is a necessary part of a public agency's long range plans for public outdoor recreation;

(2) The project is consistent with the recreation element of the Regional Plan;

(3) The project, by its very nature must be sited in land capability districts 1–3;

(4) There is no feasible alternative which avoids or reduces the extent of encroachment in land capability districts 1–3;

(5) The impacts are fully mitigated; and

(6) Land capability districts 1–3 lands are restored in the amount of 1.5 times[2] the area of land capability districts 1–3 which is disturbed or developed beyond that permitted by the Bailey coefficients.

C. Public service facilities are permissible uses in land capability districts 1–3 if:

(1) The project is necessary for public health, safety or environmental protection;

(2) There is no reasonable alternative, which avoids or reduces the extent of encroachment in land capability districts 1–3;

(3) The impacts are fully mitigated; and

(4) Land capability districts 1–3 lands are restored in the amount of 1.5 times[3] the area of land capability districts 1–3 which is disturbed or developed beyond that permitted by the Bailey coefficients.

6. Grading, filling, clearing of vegetation (which disturbs soil), or other disturbances of the soil are prohibited during inclement weather and for the resulting period of time when the site is covered with snow or is in a saturated, muddy, or unstable condition. Special regulations and construction techniques will apply to all construction activities occurring between October 15 and May 1.

7. All existing natural functioning SEZs shall be retained as such and disturbed SEZs shall be restored whenever possible.

<u>Shorezone</u>

Goal #1: Provide for the appropriate shorezone uses of Lake Tahoe, Cascade Lake, and Fallen Leaf Lake while preserving their natural and aesthetic qualities.

[2] Per Chapter 20 of the TRPA Code, mitigation ratio of 1.5 to 1 in low capability lands only applies to non-water quality elements of a project.

[3] Per Chapter 20 of the TRPA Code, mitigation ratio of 1.5 to 1 in low capability lands only applies to non-water quality elements of a project.

Policies

1. *All vegetation at the interface between the backshore and foreshore zones shall remain undisturbed unless allowed by permit for uses otherwise consistent with the shorezone policies.*

4. *Class 1 capability shorezones shall be managed consistent with the goals and policies of the stream environment zone subelement.*

6. *Low to moderate intensity dwelling and recreational uses should be allowed in the stable and high capability backshore areas of class 4 and 5 capability shorezones.*

8. *Stream channel entrances to the lake shall be maintained to allow unobstructed access of fishes to upstream spawning sites.*

Stream Environment Zone

Goal #1: Provide for the long-term preservation and restoration of stream environment zones.

Policies

2. *SEZ lands shall be protected and managed for their natural values.*

5. *No new land coverage or other permanent land disturbance shall be permitted in stream environment zones except for those uses as noted in a, b, c, d, and e below:*

   A. *Public outdoor recreation facilities are permissible uses in stream environment zones if:*

      (1) The project is a necessary part of a public agency's long range plans for public outdoor recreation;

      (2) The project is consistent with the recreation element of the regional plan;

      (3) The project, by its very nature, must be sited in a stream environment zone;

      (4) There is no feasible alternative which would reduce the extent of encroachment in stream environment zones;

(5) The impacts are fully mitigated;

(6) Stream environment zone lands are restored in the amount of 1.5 times the area of stream environment zone which is disturbed or developed by the project.

B. Public service facilities are permissible uses in stream environment zones if:

(1) The project is necessary for public health, safety or environmental protection;

(2) There is no reasonable alternative, including spans, which avoids or reduces the extent of encroachment in stream environment zones;

(3) The impacts are fully mitigated; and

(4) Stream environment zone lands are restored in the amount of 1.5 times the area of stream environment zone which is disturbed or developed by the project.

C. Projects which require access across stream environment zones to otherwise buildable sites are permissible in SEZs if:

(1) There is no reasonable alternative, which avoids or reduces the extent of encroachment in the SEZ;

(2) The impacts are fully mitigated; and

(3) SEZ lands are restored in the amount of 1.5 times the area of stream environment zone which is disturbed or developed by the project.

D. New development may be permitted in man-modified stream environment zones where:

(1) The area no longer exhibits the characteristics of a stream environment zone;

(2) Further development will not exacerbate the problems caused by development in stream environment zones;

(3) Restoration is infeasible; and

(4) Mitigation is provided to at least partially offset the losses which were caused by modification of the stream environment zones.

E. Stream environment zone restoration projects and erosion control projects.

6. Replacement of existing coverage in stream environment zones may be permitted where the project will reduce impacts on stream environment zones and will not impede restoration efforts.

TRPA Code of Ordinances

The following TRPA ordinances (Tahoe Regional Planning Association 2004a) apply to activities associated with the proposed action.

- Section IV (Site Development Provisions): This section has information on Land Coverage Standards (Chapter 20), Best Management Practice Requirements (Chapter 25), Natural Hazard Standards (Chapter 28), and Design Standards (Chapter 30).
- Section VII (Shorezone Provisions): This section has information on Development Standards in the Backshore (Chapter 55).
- Section VIII (Grading and Construction Provisions): This section has information on Grading and Construction Schedules (Chapter 62), Grading Standards (Chapter 64), and Vegetation Protection During Construction (Chapter 65).
- Section IX (Resource Management Provisions): This section has information on Vegetation Protection and Management (Chapter 74).
- Section X (Water Quality Provisions): This section has information on Water Quality Control (Chapter 81) and Water Quality Mitigation (Chapter 82).

Water Quality Management Plan for the Lake Tahoe Region

The Handbook of BMPs in the Water Quality Management Plan for the Lake Tahoe Region (Tahoe Regional Planning Agency 1988) identifies the recommended BMPs for various situations. This document is currently being updated. Additional guidance and design documents will be utilized in the design of temporary and permanent BMPs for

this project. For further information on the Water Quality Management Plan for the Lake Tahoe Region, as well as specific BMPs, see *Section 3.13, Water Quality.*

Kings Beach Community Plan

Pursuant to Chapter 14 of the TRPA Code of Ordinances (Tahoe Regional Planning Association 2004a), the Kings Beach Community Plan (Placer County and Tahoe Regional Planning Agency 1996) supersedes certain plans and regulations established by the TRPA PASs and the TRPA Code of Ordinances for the area within the Community Plan boundaries. For purposes of Placer County land use regulation, the Community Plan and the Placer County General Plan and implementing ordinances are one and the same. The Community Plan is intended to serve as the mutual plan for all regulatory authorities.

There are no goals and objectives, special policies, programs, and strategies in the Kings Beach Community Plan that are directly relevant to geology, seismicity, and soils. However, the Conservation Element (itself is a supplement to the Conservation Element of the Regional Plan for the Basin) contains updated information about baseline information, TRPA thresholds, TRPA Regional Plan requirements, and additional information on SEZs, Land Coverage, and Water Quality.

3.12.3 Environmental Consequences (Including Permanent, Temporary, Direct, Indirect)

This section describes analysis relating to geology, seismicity, and soils for effects as a result of the built alternatives. It describes the methods used to determine whether an effect would be adverse or not. Measures to mitigate (avoid, minimize, rectify, reduce, eliminate, or compensate for) adverse effects accompany each impact discussion.

3.12.2.4 Approach and Methods

Evaluation of the impacts in this section is based on technical maps, soil surveys, reports, and professional judgment. This impact analysis assumes that the project applicant will conform to all regulatory requirements as described above. UBC standards and

California Building Standards Code (CBSC) standards do not apply because no structures intended for human occupancy would be built as part of the proposed action.

3.12.2.5 Evaluation of Impacts

Alternative 1

Under this alternative, it is assumed that the existing conditions would persist and that there would be minimal associated environmental consequences.

Alternatives 2, 3, and 4

Impact GEO-1. Increase the Potential for Structural Damage and Injury Caused by Fault Rupture

As described in the *Seismicity* section above, fault rupture from buried thrust faults, inferred faults, and unidentified faults presents a potentially adverse hazard. Fault rupture has the potential to compromise the structural integrity of proposed new roadway facilities and expose a greater surface area (and more people) to fault rupture hazard. However, this is not considered an adverse effect because, based on existing published data on officially recognized faults, the risk of surface rupture and faulting in the action area is apparently low because none of the faults described above occur within an Alquist-Priolo Earthquake Fault Zone nor directly occur in the vicinity of the action area. Additionally, new features in the form of off-street parking and operational improvements will lead to additional hard coverage with minimal changes to the existing landscape. Thus, the area that could potentially be affected by fault rupture would not adversely increase in size. Furthermore, the proposed action itself does not increase the present surface rupture hazard. No mitigation is required.

Impact GEO-2. Increase the Potential for Structural Damage and Injury Caused by Ground Shaking

A large earthquake could potentially cause moderate ground shaking in the action area. Anticipated ground acceleration at the site is great enough to cause structural damage to new features. However, new features in the form of off-street parking and operational improvements will lead to minimal changes to the existing landscape and man-made

facilities. Thus, the area project improvements that could potentially be affected by ground shaking would not significantly increase in size and would have a low potential to result in any adverse effects, structural damage, or injury. Furthermore, the proposed action itself does not increase the present ground-shaking hazard. Finally, the recommendations in Appendix B of each Kleinfelder geotechnical report (Kleinfelder 2004, 2006) concerning site preparation, excavation, structural fill, compacted fill, utility trench bedding and backfill, subsurface drainage, subgrade and aggregate base for paved areas, aggregate base for concrete slabs, and asphalt concrete pavement would reduce further minimize this effect. Mitigation Measure GEO-1 summarizes the mitigation measures found in Appendix B of each Kleinfelder geotechnical report (not included).

Impact GEO-3. Increase the Potential for Structural Damage and Injury as a Result of Development on Materials Subject to Liquefaction

Based on the sedimentological characteristics of the soils and the nonsaturated nature of the soil types and moderate depth to groundwater, the liquefaction hazard is expected to be low for the action area.

Impact GEO-4. Increase the Potential for Structural Damage and Injury as a Result of Landsliding

Within the limits of ground disturbance of the action area, there is no risk of naturally occurring large landslides because it is essentially flat and topographically featureless.

Impact GEO-5. Temporarily Increase the Potential for Accelerated Runoff, Erosion, and Sedimentation as a Result of Grading and Construction Activities

The proposed roadway and off-street improvements would involve grading, removal of vegetation cover, and loading activities associated with construction activities. These activities could temporarily increase runoff, erosion, and sedimentation. Construction activities could also result in soil compaction and wind erosion effects that could adversely affect soils and reduce the revegetation potential at the construction sites and staging areas. The following actions will ensure that runoff, erosion, and sedimentation do not occur as a result of the proposed action.

However, a SWPPP would be developed by a qualified engineer and landscape architect or erosion control specialist and implemented before construction. The SWPPP would be kept on-site during construction activity and will be available upon request to representatives of the LRWQCB. The objectives of the SWPPP would be to 1) identify pollutant sources that may affect the quality of stormwater associated with construction activity, and 2) identify, construct, and implement stormwater pollution prevention measures to reduce pollutants in stormwater discharges during and after construction. Therefore, the SWPPP would include a description of potential pollutants, management of sediment, and hazardous materials present on-site during construction (including vehicle and equipment fuels). The SWPPP would also include details of how the sediment and erosion control practices (BMPs) would be implemented. The SWPPP would comply with applicable state and federal water quality regulations.

Compliance with applicable sections of Article 15.48 of Chapter 15 and Article 12.32 of Chapter 12 of the Placer County Code (Placer County 2006a), Placer County General Construction Specifications (Placer County 1994), Caltrans Standard Specifications (May 2006) and Standard Plans (May 2006), goals and policies of the Regional Plan for the Lake Tahoe Basin (Tahoe Regional Planning Agency 2004b), TRPA Code of Ordinances (Tahoe Regional Planning Agency 2004a), and the *Handbook of Best Management Practices in the Water Quality Management Plan for the Lake Tahoe Region* (Tahoe Regional Planning Agency 1988) would help to minimize any negative effects associated with runoff, erosion, and sedimentation, as well as soil compaction. Construction site BMPs will also comply with the Caltrans Construction Site BMPs manual.

Additionally, the recommendations in Appendix B of each Kleinfelder geotechnical report (Kleinfelder 2004, 2006) concerning site preparation, excavation, structural fill, compacted fill, utility trench bedding and backfill, subsurface drainage, subgrade and aggregate base for paved areas, aggregate base for concrete slabs, and asphalt concrete pavement would help to minimize the severity of this effect. Mitigation Measure GEO-1 summarizes the mitigation measures found in Appendix B of each Kleinfelder geotechnical report (not included).

For further information on specific BMPs, see *Section 3.13, Water Quality.*

Impact GEO-6. Increase the Potential for Structural Damage and Injury as a Result of Development on Expansive Soils

Soil map units within the action area are not considered expansive. Expansive materials are those that could pose a risk to structural damage due to their significant clay content, which can result in welling and compression during changes in moisture content.

3.12.4 Mitigation, Avoidance, Minimization, and Compensation Measures

Project components located in areas that are either too steep of terrain or located in wetland, marsh, and/or SEZ were eliminated from consideration. Under Alternatives 2 through 4, new features in the form of off-street parking and operational improvements will lead to additional hard coverage with minimal changes to the existing landscape. These changes are not anticipated to result in substantial impacts pursuant to CEQA, NEPA, or TRPA Code. The existing geology has been taken into consideration during the project design process. Compliance with standard permit requirements would help to minimize the severity of most effects. However, beyond the identified standard permits (e.g., a SWPPP), Mitigation Measure GEO-1 will further minimize effects on geologic, seismic, or soil resources.

Mitigation Measure GEO-1: Incorporate Recommendations from Geotechnical Reports into Project Design

Recommendations in Appendix B (not included) of each Kleinfelder geotechnical report (Kleinfelder 2004; Kleinfelder 2006) concerning site preparation, excavation, structural fill, compacted fill, utility trench bedding and backfill, subsurface drainage, subgrade and aggregate base for paved areas, aggregate base for concrete slabs, and asphalt concrete pavement will be incorporated into the project design, thus minimizing any negative effects associated with ground-shaking hazards, and runoff, erosion, and sedimentation from construction activities. In addition, these recommendations, if fully implemented, will result in well-built, long-term functioning improvements. The project applicant and its contractor(s) will be required to implement this mitigation measure before any

construction activities begin. The recommendations will be incorporated into the project construction specifications as appropriate.

3.12.5 Compliance with Tahoe Regional Planning Agency Code

The following TRPA Thresholds (Tahoe Regional Planning Agency 2002) apply for soil conservation.

- **SC1 (Impervious Coverage):** The TRPA threshold for soil conservation requires that impervious coverage be in compliance with the coverage coefficients defined in the *Land Capability Classification of the Lake Tahoe Basin California-Nevada, A Guide for Planning* (Bailey 1974). Additional land coverage is monitored on a project basis and recorded in square feet. Coverage may be utilized directly or by coverage transfers within a related project area. An excess coverage mitigation program is in place to gradually reduce existing land coverage.
- **SC2 (Naturally Functioning SEZ):** TRPA policy requires the preservation of existing naturally functioning SEZ lands in their natural hydrologic condition; the restoration of all disturbed SEZ lands in undeveloped; unsubdivided lands and the restoration of the SEZ lands that have been identified as disturbed, developed or subdivided to obtain a 5% total increase in the area of naturally functioning SEZ lands.

TRPA is concerned about the potential creation of additional coverage and its effect on soil. According to Chapter 20.3.B(8) of the TRPA Code of Ordinances (Tahoe Regional Planning Association 2004a), the proposed roadway and off-street improvements will create impervious coverage that is not exempt from the Bailey land coverage limits. Consequently, the proposed action is subject to the Bailey land coverage limit requirements identified in Chapter 20 (Land Coverage Standards) of the TRPA Code of Ordinances (Tahoe Regional Planning Association 2004a) and these requirements must be met.

TRPA requires that any newly created impervious coverage that did not exist prior to 1972 be offset with the creation of restored covered areas or the transfer of banked coverage. The addition of asphalt/concrete and the placement of structures via shoulder widening, intersection reconstruction, and associated drainage improvements are expected to increase impervious land coverage within the action area. In addition, these improvements could require vegetation removal. However, these areas will be revegetated with native plants and grasses upon completion of the improvements, although revegetation of some improved areas may not be feasible due to the conversion of these areas to "hard" impervious surfaces. All vegetation removal and subsequent restoration (including revegetation) of existing soft coverage areas ("soft" coverage consists of compact nonvegetated soils) within the action area would be accomplished by applying appropriate (nonimpervious) erosion control materials as determined by Caltrans Landscape Architecture branch, in conjunction with TRPA approval.

The amount of proposed new, relocated, and/or transferred land coverage in SEZ and non-SEZ lands is currently unknown. This is because the verified available coverage will not be known until final design and coverage verification is completed and a permit is secured from TRPA in accordance with the TRPA code. A land capability verification of the CCIP was performed by TRPA in 2004, and Placer County is currently undergoing backshore verification with TRPA.

Once the preferred alignment alternative and off-site parking locations have been identified, the amount of SEZ and non-SEZ lands converted to hard coverage as part of the proposed action, as well as the amount of needed to compensate for the loss of existing soft coverage/creation of additional hard coverage, will be identified. All new hard coverage created with implementation of the proposed action will be fully compensated based on Chapter 20 of the TRPA Code, which requires a mitigation ratio of 1 to 1 for high capability lands and 1.5 to 1 for low capability lands that are non-water quality improvements (as determined by TRPA). If restoration (including revegetation) of existing soft coverage areas is not feasible to fully compensate the new hard coverage, the application of banked coverage/purchase of land coverage credits will be made.

The coverage impacts and details of the restored soft covered areas and transfer of banked coverage will be assessed through the Coverage Verification submittal to TRPA during the design phase for the proposed action, and all coverage transfers will be in compliance with the TRPA Code. TRPA is concerned about how to prevent new coverage from being created after the roadway improvements are made because there is potential for soft coverage to increase after the roadway widening. In areas where the roadway would be widened, automobiles may continue to park off pavement and create new areas of compacted dirt and disturbance of adjacent roadways. In an attempt to thwart autos from creating new areas of coverage, Placer County will analyze the feasibility of incorporating rock embedded berms, bollards, and landscaping as part of the proposed action.